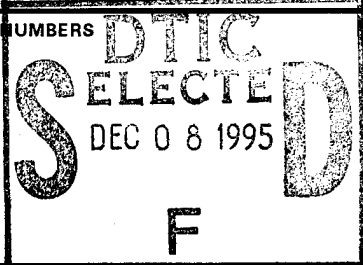


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Naval Facilities Engineering Service Center
Port Hueneme, California 93043-4328

Groundwater Circulation Well Environmental Cleanup Systems

INTRODUCTION

When a contaminant is treated in place on the original site it is termed *in situ* remediation. Bioremediation refers to cleanup effected by living organisms such as bacteria and fungi. Certain species of bacteria are able to consume pollutants as a food source, thus detoxifying these compounds. *In situ* bioremediation is being considered as a viable and practical solution for reducing petroleum contamination levels in groundwater.

The groundwater circulation well technology (Figure 1) is designed to stimulate microorganisms in groundwater, thus optimizing environmental conditions for de-

grading petroleum contaminants. The main advantage of *in situ* bioremediation is the capability to correct a problem where it exists. *In situ* bioremediation has proven to be successful in treating groundwater contaminated with petroleum products such as waste oil, jet fuels, diesel, and gasoline.

PURPOSE OF THE GROUNDWATER CIRCULATION WELL AT PORT HUENEME

At the Naval Construction Battalion Center (CBC) in Port Hueneme, a leaking underground gasoline storage tank contaminated a shallow water aquifer beneath the tank. (Note: This shallow water aquifer is not used as a drinking water source.) The purpose of the groundwater circulation well system at CBC is to provide a viable, cost effective method to remove the gasoline contaminant from the shallow water aquifer.

ADVANTAGES OF GROUNDWATER CIRCULATION WELLS

- Cleans a petroleum contaminated aquifer easily.
- Leaves the site intact, yet removes the petroleum contaminant.
- Costs less and is more effective than an on-site pump and treat system.

GROUNDWATER CIRCULATION WELLS

A groundwater circulation well cleans up petroleum contaminated groundwater and the saturated soil site. It

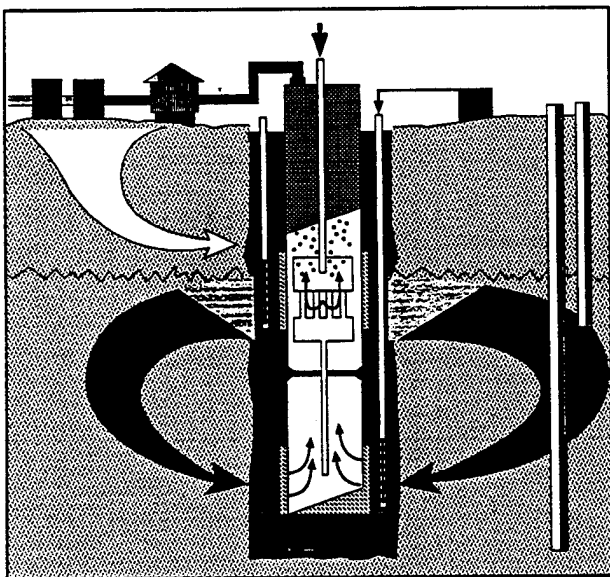


Figure 1. Groundwater circulation well (UVB system).

is a non-invasive, *in situ* system working in place so that soil does not have to be removed and the groundwater does not have to be pumped out and treated.

Circulation of groundwater is generated by pulling outside air through the well system, Figure 1. This air is directed in a way that causes bubbling to occur in the groundwater within the well. An uplift effect is created pulling groundwater up from the deep section of the well and circulating it out at a shallow point in the well creating a circulation cell in the aquifer.

The groundwater circulation also moves air through the soil exposing indigenous soil bacteria to more contaminants; therefore more contaminant is degraded than would be in a static system. The bubbling effect aerates the water supplying necessary oxygen to the bacteria.

Volatile contaminants from the groundwater could be released to the circulated air as a result of the system operation. The air used for circulation is pulled out of the well and passed through a carbon filter so that only clean air is released to the environment. A system can be modified to include nutrient addition to further stimulate bacterial activity. Additionally a bioreactor containing bacteria specialized in degrading the contaminant of interest can be installed inside the well.

For more information on the groundwater circulation well system, contact Mr. Jeff Heath, Manager, Technology Application Branch, Code ESC414, at (805) 982-1657 or DSN: 551-1657, or call our 24-hour number: (805) 982-4070 or DSN: 551-4070.

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